

SCIENCE

VOL. 92

FRIDAY, AUGUST 16, 1940

No. 2381

<i>The National Roster of Scientific and Specialized Personnel</i> : PRESIDENT LEONARD CARMICHAEL	135
<i>The Production, Retention and Attraction of American Men of Science</i> : PROFESSOR E. L. THORNDIKE	137
Obituary: <i>John Gerald FitzGerald</i> : PROFESSOR R. D. DEFRIES. <i>Recent Deaths and Memorials</i>	141
Scientific Events: <i>Dispersal of Schools of the University of London; Expeditions of the American Museum of Natural History; The New York Zoological Society; Symposium on New Textiles of the American Chemical Society; The American Society of Mechanical Engineers</i>	142
<i>Scientific Notes and News</i>	145
Discussion: <i>Insect Cultures Inbred for Two Hundred Generations</i> : DR. D. F. MILLER. <i>Spontaneous Activity of the Spinal Tadpoles of the Frog and the Toad</i> : GING-HSI WANG and TSE-WEI LU. <i>The Case History of a Scientific News Story</i> : DR. G. G. SIMPSON	147
Societies and Meetings: <i>The Eastern Section of the Seismological Society of America</i> : PROFESSOR WILLIAM A. LYNCH. <i>The Botanical Conference and Foray at the Allegany School of Natural History</i> : DR. ROBERT B. GORDON	150

Reports:

<i>The William John Gies Award, Research Fellowships and Grants-in-Aid of the American College of Dentists</i> : A. L. MIDGLEY	151
--	-----

Special Articles:

<i>The Voltammetric Determination of Oxygen</i> : DR. I. M. KOLTHOFF and H. A. LAITINEN. <i>A Deficiency Disease of Foxes</i> : DR. R. G. GREEN and C. A. EVANS	152
---	-----

Scientific Apparatus and Laboratory Methods:

<i>A Simple Method for Preparing Antigenic Substances from the Typhoid Bacillus</i> : DR. JOHN W. PALMER and TILLMAN D. GERLOUGH	155
--	-----

<i>Science News</i>	6
---------------------------	---

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

Lancaster, Pa.

Garrison, N. Y.

New York City: Grand Central Terminal

Annual Subscription, \$6.00

Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

THE NATIONAL ROSTER OF SCIENTIFIC AND SPECIALIZED PERSONNEL

By LEONARD CARMICHAEL

PRESIDENT OF TUFTS COLLEGE

THE National Roster of Scientific and Specialized Personnel is a project of the United States Government, planned to make available in one central office an index of all American citizens who have special scientific or professional skills which may be of importance to the nation in periods of emergency and in normal times.

A somewhat similar register has been completed in England under the sponsorship of the Royal Society. There is no doubt that similar catalogues are available in the totalitarian nations.

The American Roster of Scientific and Specialized Personnel is being developed as a means of recording in an accurate way one of the important areas of the human resources of the nation. It is peculiarly ap-

propriate, therefore, that the national roster is being developed by the federal government as a joint project of the National Resources Planning Board and of the Civil Service Commission. The latter agency is especially concerned in the matter because its executives have seen clearly that the modern advance of scientific and technical specializations has rendered it necessary that the nation should be able to call upon its specialized personnel in an intelligent and efficient manner.

Thus, the fundamental idea behind the new roster is conservation. It is recognized by all that the services of experts may be crucial in preserving the welfare of the nation. A chemist whose work has been done in some specialized and relatively obscure field

may suddenly become the one man in the country able to devise a means of protection against some new chemical weapon. A specialist in an obscure dialect of a foreign language may possess a skill which will have far-reaching significance in an emergency. The conservation of specialized work now in progress is also important to the nation. It is most desirable not to disturb an important cooperating group of scientists in a certain laboratory if similarly trained experts not so engaged can be found elsewhere.

All these facts point to the desirability and, indeed, the necessity of a national roster of the sort now being compiled. In England, because of the smaller size of the country and because of the nature of its university system, such a roster would have seemed much less necessary than in the United States, but the scientific register completed there last year has, according to published accounts, proved to be of great national value.

It is significant that the demand for the national roster in America arose from governmental agencies concerned with national resources and with Civil Service appointments on the one hand, and on the other hand from the great non-governmental councils which represent the specialized scientific and professional personnel of the country.

The organization meeting of the national roster was held in the office building of the Department of State in Washington on June 28. Frederic A. Delano, president of the National Resources Planning Board, was in the chair. Present also were Thomas C. Blaisdell, Jr., of the National Resources Planning Board, and Arthur S. Flemming, Civil Service Commissioner. Among others present were the following: Representing the National Research Council, Ross A. Harrison and Albert L. Barrows; representing the American Council on Education, W. H. Cowley; representing the American Council of Learned Societies, D. H. Daugherty and H. G. Doyle; and representing the Social Science Research Council were R. T. Crane and Carl C. Brigham. Charles F. Ascher and Joseph G. Harris also attended. It was announced that Leonard Carmichael had been chosen as chairman of the consulting committee and director of the project, and that James C. O'Brien, an experienced executive of the Civil Service Commission, had been made executive officer of the new project. J. S. Nicholas has subsequently been appointed to represent the National Research Council.

The committee decided to consider that the ultimate field to be embraced by the roster should be the inclusion of all scientific and professional workers in the United States. When such a comprehensive classification is worked out, it will complement and supplement any general register of American personnel in all walks of life if such a general register is later estab-

lished. Again to refer to the English precedent, it may be said that in spite of the general register in that country, it was recognized that a separate and detailed index of the specialized personnel of the nation was necessary.

The ultimate scope of the register having thus been agreed upon, it was at once recognized that the achievement of this aim could not be realized at once. Two criteria were then agreed upon to determine the professional areas in which the register should then begin its work: (1) it was decided that the fields of greatest present need, as already expressed by agencies of the government, should determine the sectors in which information should first be collected. (2) it was also decided that, given two fields of relatively equal significance for the present needs of the government, that field should first be catalogued in which personnel records are at the present time least complete.

Incidental to starting work upon the register, the Civil Service Commission is now engaged in collecting lists of the membership of all scientific and professional societies of the country. In collecting these lists, the constituent societies of the National Research Council and the other councils of learned societies are being especially canvassed.

The register itself is planned as a card index punched with the appropriate information concerning each individual in the register. The preparation of punch cards to make the analysis of large and divergent categories of information analytically available is a technical problem. An expert administrative staff will direct this aspect of the development of the register. It is agreed, in this connection, that the existing federal codes of occupations, such as that prepared by the Civil Service Commission in its project looking to the coding of all positions in the federal service, shall be used in all cases as a basis for the new and highly specialized classification required in the register.

The necessary information concerning individuals is to be secured by sending each professional man a general questionnaire to secure information concerning geographical location, age, sex, training, etc., and also a specialized questionnaire or check-list intended to cover in detail his own special field, as, for example, physics. The special check-lists or code analyses in each of the specialized fields are to be drawn up by experts in each field in relation to existing empirical data concerning the actual work of men in these fields. This information will be called for in a manner which will make it possible to attach it directly to the existing codes now in use in the government services. In securing this information, the hobbies of scientific and professional men will not be neglected. The English experience has shown that, for example, a biologist

who has as his hobby the designing of special radio circuits may be more valuable to the nation as a communications engineer than in his own special field of professional competence.

It is recognized that selection of men for important governmental posts and, indeed, for less important specialized activities can not be reduced to a mechanical card-sorting procedure. It is therefore planned to organize committees in each of the specialized fields based upon nominations of those working in these fields. These special committees of experts are to be asked in certain instances to evaluate the names of individuals who are presented to them by the automatic process of the punch-card technique. These special committees are also to be charged with the duty of protecting present educational and research endeavors which are performing important public services to the maximum degree possible.

Fundamentally, the aim of the national roster is the development of a means for the efficient and rapid but appropriate use of the specialized brains of America in the service of the nation. As the English commission has said: "The National Service Department is fully alive to the consequences of the errors of assign-

ments made in the war of 1914-18 and is anxious to avoid repetition of those errors and to insure that each man who offers his services is assigned to that task for which his knowledge, training and capacities best fit him."

Once started and organized, it seems that the value of the roster to many constructive activities of peace time, especially in connection with modern personnel and employment services, will be obvious. It seems clear that with the passing of the present emergency, this roster should not be abandoned, but rather, maintained as a continuing and always up-to-date census of the specialized brains of America. Even in a complete and continuing form, the development and maintenance of such a register will not be expensive in comparison with some of the other projects already undertaken for the preservation and effective use of our natural resources. Moreover, the procedures which will be based upon the use of the roster are at once effective and truly democratic.

The time has come when our nation must be efficient. The National Roster of Scientific and Specialized Personnel is certainly a necessary tool of an effective democracy.

THE PRODUCTION, RETENTION AND ATTRACTION OF AMERICAN MEN OF SCIENCE¹

By Professor E. L. THORNDIKE

TEACHERS COLLEGE, COLUMBIA UNIVERSITY

THE facts reported in this article are based on the persons listed on 1,500 of the pages of the 1938 edition of "American Men of Science." Wherever a number is stated as for all the persons listed in that book, it is (unless otherwise stated) obtained by multiplying the number obtained from these 1,500 pages by 1.0667. The divergences between the rates reported and those which a complete count of all 1,600 pages would have produced are of no consequence.

Column 1 of Table 1 states the number of A.M.S. entries residing in each state. Column 2 of Table 1 states the number of A.M.S. entries residing in each state per million population in 1930. The median is 189. There is a wide variation, from 46, 57 and 67 for Miss., Ark. and Ala. to 461 for Nev., 482 for Md. and 1,179 for Del. Six states are below 100 and nine are above 300.

Column 3 of Table 1 states the number of members of the A.A.A.S. reported for 1934 (*Proceedings of the A.A.A.S.*, Vols. 82 to 87). Even without allowance for the number of memberships by institutions and by

amateurs not listed in American Men of Science, the differences between column 2 and column 3 show regrettably large numbers of men of science who fail to cooperate with the American Association.

Column 4 states the percentage which the A.A.A.S. membership is of the A.M.S. enrolment for each state. It has a median at 61, and ranges from 26 for Delaware to 96 for Connecticut; 43 of the states have percentages from 40 to 80.

Column 5 states the number of A.M.S. persons born in each state. When this number $\times 1,000,000$ is divided by the sum of the 1890 and 1900 populations the result is as given in Column 6. The numbers in Column 6 may be called approximate relative birth-rates. They are by no means perfect as measures of the comparative productivity of the states, but the errors are small in comparison with the differences among the states. It would be impossible to obtain for each state and each period the percentage of those born in the state who would, before they died, or before they reached some specified age, be enrolled in any specified list.

The birth-years of American men of science are

¹ The work reported here was one item of a project supported by the Carnegie Corporation.

TABLE 1
AMERICAN MEN OF SCIENCE IN THE 48 STATES

	Number residing	Number residing per million of 1930 population	Number of members of the A.A.A.S.	Percentage which A.A.A.S. membership is of A.M.S.	Number born	Number born $\times 1,000,000$ /sum of 1890 + 1900 populations	Number born per 100,000 white population in 1890	Percentage of those born in the state and residing in the U.S.A. residing in the state of birth	Per cent. which the entry of column 8 is of the corresponding percentage for all persons born in the state	Number (of A.M.S.) born in other states residing in the specified state	100,000 \times the entry of column 10 divided by the number of all persons born in other states residing in the specified state	Number of A.M.S. born in foreign countries	Number of A.M.S. born in foreign countries $\times 100,000$ divided by the total number of foreign-born in the specified state in 1930
	1	2	3	4	5	6	7	8	9	10	11	12	13
Ala.	177	67	34	51	157	47	19	23	30	132	43	8	50
Ariz.	131	301	248	82	20	95	36	17	24	114	57	12	18
Ark.	105	57	23	40	127	52	16	10	15	90	18	3	28
Cal.	1,817	320	257	80	555	206	50	52	57	1,302	50	225	21
Colo.	288	278	179	64	324	340	80	12	19	229	45	19	19
Conn.	577	359	343	96	460	278	63	18	23	422	138	69	18
Del.	281	1,179	302	26	49	139	35	18	26	247	377	21	123
Fla.	243	165	96	58	45	49	20	13	16	211	32	16	23
Ga.	239	82	40	49	177	44	18	31	41	179	60	7	49
Id.	86	193	88	46	63	252	77	9	14	77	35	4	12
Ill.	1,604	210	149	71	1,758	203	47	22	30	1,039	67	182	15
Ind.	515	159	91	57	1,138	242	53	17	24	333	48	39	27
Iowa	474	192	119	62	1,107	267	58	11	18	321	65	31	18
Kan.	314	167	94	56	695	240	50	10	16	223	34	24	30
Ky.	183	70	49	70	315	79	20	16	23	126	43	9	41
La.	255	121	90	74	122	49	22	39	48	189	70	18	49
Me.	148	186	104	56	347	256	53	13	18	94	150	11	11
Md.	787	482	274	57	503	226	61	27	35	572	177	70	73
Mass.	1,501	353	254	72	1,516	301	68	30	37	882	173	161	15
Mich.	884	183	112	61	896	198	43	22	27	598	53	90	11
Minn.	561	219	134	61	642	210	50	22	30	380	75	53	14
Miss.	92	46	22	48	150	53	28	21	28	58	23	2	25
Mo.	514	142	112	79	844	146	33	15	23	347	39	44	29
Mont.	110	205	121	59	96	249	75	9	14	95	40	6	8
Neb.	189	137	103	75	434	204	41	10	15	131	35	15	13
Nev.	42	461	329	71	15	167	38	29	58	36	78	1	7
N. H.	139	299	189	63	212	269	56	10	15	103	101	14	17
N. J.	1,076	266	165	62	450	135	32	18	21	831	79	153	18
N. M.	87	205	142	69	30	84	21	11	16	78	54	6	25
N. Y.	3,937	311	264	85	2,612	197	44	40	48	2,329	169	546	17
N. C.	369	116	57	49	268	76	25	29	35	269	85	22	245
N. D.	73	107	69	64	95	186	52	7	10	60	33	6	6
Ohio	1,331	200	134	67	1,775	227	50	23	29	812	60	111	17
Okla.	277	116	55	47	112	107	?	16	22	235	20	23	75
Ore.	225	236	128	54	159	218	53	13	18	186	41	20	18
Pa.	1,846	192	136	71	1,883	163	37	30	33	1,077	112	193	16
R. I.	147	214	163	76	163	211	48	15	19	107	91	15	9
S. C.	139	80	40	50	205	82	44	15	20	99	73	8	149
S. D.	71	102	42	41	192	256	59	3	4	62	27	3	5
Tenn.	271	104	63	61	240	63	18	17	24	210	50	20	151
Tex.	583	100	67	67	429	81	25	34	40	411	36	27	8
Utah	143	282	144	51	240	492	117	32	44	62	79	6	13
Vt.	78	217	117	54	195	288	59	10	15	53	89	6	14
Va.	443	183	111	61	439	125	43	25	35	297	90	32	131
Wash.	290	186	100	54	204	233	60	14	18	236	33	27	11
W. Va.	182	105	60	57	192	111	26	21	27	131	38	11	21
Wis.	540	184	119	65	855	227	51	16	21	357	94	43	11
Wyo.	70	310	102	33	37	139	63	11	20	65	50	2	9

approximately as shown in Table 2 for a random sample of 2,000 of them. The rates of Column 6 of Table 1 will be more or less unjust to certain states which had relatively larger populations in 1890 and 1900 than over the whole period during which the persons enrolled were born.

TABLE 2

AGE DISTRIBUTION OF AMERICAN MEN OF SCIENCE. NUMBER BORN AMONG TWO RANDOM THOUSANDS OF AMERICAN MEN OF SCIENCE, 1938

	I	II	Av.
Before 1860	3	10	6.5
1860-1864	22	26	24
1865-1869	28	43	35.5
1870-1874	75	70	72.5
1875-1879	55	81	68
1880-1884	92	88	90
1885-1889	113	127	120
1890-1894	148	133	140.5
1895-1899	153	156	154.5
1900-1904	166	148	157
1905-1909	124	104	114
1910 or later	21	14	17.5
			1000.0

For the sake of those who are interested in rates based on the white population, Column 7 of Table 1 shows the number of A.M.S. entries per 100,000 white population in 1890.

Column 8 of Table 1 states the percentage which the number born in a state and residing in it in 1938 is of the number born in it and residing anywhere in the United States. The mobility of American men of science is very great, the average percentage residing in the state of birth being 19, about a fourth that for the general population. The variation among states is wide, the percentages ranging from 3 for South Dakota to 52 for California, four being less than 10 and eight being 30 or more.

It is for certain purposes more important to know a state's retention of its future men of science in comparison with its retention of the generality of those born in it. Column 9 of Table 1 reports the ratio, *per cent. retained of A.M.S./per cent. retained of all persons born*, for each state. The variation is great.

The attraction of American men of science to each state is shown by columns 10 to 13. Column 10 states the number of A.M.S. men born in other states residing in each state. Column 11 states the ratio of this number to the total number of residents of the state who were born in other states. The variation among states in this ratio is very great. For every 100,000 immigrants from other states Arkansas has 18 men of science, Mississippi has 23, Oklahoma has 20 and South Dakota has 27, whereas Delaware, Maryland, Massachusetts and New York have respectively 377, 177, 173 and 169. The differences are obviously connected with differences in the amount of manufacturing relative to agriculture, but that is not the whole story. For Iowa, Louisiana, Maine, Minnesota, New Hamp-

shire, North Carolina, South Carolina and Utah are high, Alabama is below Georgia, Pennsylvania is below Maryland, and there are other discrepancies. The number of men of science born in foreign countries is given for each state in column 12, and the ratio of this number to the total number of foreign-born residing in the state is given in column 13.²

Table 3 presents the facts of columns 6, 9, 11 and 13 as deviations + or - from the score of the median state for the fact in question.³

TABLE 3

THE FACTS OF COLUMNS 6, 9, 11 AND 13 OF TABLE 1 EXPRESSED AS DEVIATIONS FROM THE SCORE OF THE MEDIAN STATE FOR THE FACT IN QUESTION

	6 Birth	9 Retention	11 Attraction from other states	13 Attraction from for- eign countries
Ala.	-17	7	-4	16
Ariz.	-12	1	1	0
Ark.	-17	-8	-12	5
Cal.	1	34	-2	2
Colo. ..	16	-4	-3	1
Conn. ..	9	0	26	0
Del.	-7	3	102	53
Fla.	-17	-7	-7	3
Ga.	-17	18	2	16
Id.	6	-9	-6	-3
Ill.	0	7	4	-2
Ind.	5	1	-2	5
Iowa ..	8	-5	3	0
Kan.	4	-7	-7	6
Ky.	-14	0	-4	12
La.	-17	25	5	15
Me.	6	-5	30	4
Md.	3	12	39	27
Mass. ..	11	14	37	-2
Mich. ..	0	4	-1	-4
Minn. ..	1	7	6	-2
Miss. ..	-16	5	-10	4
Mo.	-6	0	-5	5
Mont. ..	5	-9	-5	-5
Neb.	0	-8	-6	-3
Nev.	-4	35	7	-6
N. H.	8	-8	15	-1
N. J.	-7	-2	8	0
N. M.	-13	-7	0	3
N. Y.	0	25	36	-1
N. C.	-14	12	10	113
N. D.	-2	-13	-7	-6
Ohio	3	6	2	-1
Okla.	-10	-1	-11	28
Ore.	2	-5	-4	0
Pa.	-4	10	18	-1
R. I.	1	-4	11	-5
S. C.	-13	-3	6	65
S. D.	6	-19	-9	-7
Tenn.	-15	1	-2	66
Tex.	-13	17	-6	-5
Utah	33	21	8	-3
Vt.	10	-8	11	-2
Va.	-8	12	11	65
Wash. .	4	-5	-7	-4
W. Va. .	-10	4	-5	2
Wis.	3	-2	12	-4
Wyo.	-7	-3	-2	-5

² In this case, the numbers are for a complete count of all 1,600 pages of "American Men of Science."

³ The scales for Table 3 are such that in each case 20 equals approximately the range required to include 32 of the 48 states.

The ranks of the states in the production, retention and attraction of men of science more than men in general seem chaotic to a casual inspection of Table 3. And closer study does not greatly alter this impression. Except for Maryland, no state is above the median in all four respects; and the status of Maryland may be influenced by its being suburban to Washington and surely is influenced by the presence of a great private university and hospital. Except for North Dakota and Wyoming no states are below the median in all four, and their low rank in births may be due to the use of the 1890+1900 populations as a base. Their populations in 1860, 1870 and 1880 were relatively

TABLE 4

NUMBER OF AMERICAN MEN OF SCIENCE IN THE 48 STATES AND D. C. BORN IN FOREIGN COUNTRIES

Country	Number of American men of science in 48 states and D.C.	American men of science per million U.S.A. residents in 1930
England	280	346
Scotland	60	169
Wales	18	299
Ireland	21	23
Norway	52	149
Sweden	72	121
Denmark	47	262
Iceland	4	1,447
Netherlands	60	451
Belgium	20	312
Luxemburg	0	0
Switzerland	67	593
France	30	221
Germany	259	161
Poland	63	50
Czechoslovakia	32	65
Austria	98	264
Hungary	53	193
Yugoslavia	3	14
Russia	285	247
Latvia	15	726
Estonia	5	1,408
Lithuania	16	83
Finland	11	77
Rumania	18	123
Bulgaria	5	532
Turkey	14	286
Greece	15	86
Albania	0	0
Italy	22	12
Spain	5	84
Portugal	0	0
Danzig	1	674
Europe, not specified ..	2	135
Armenia	15	466
Palestine	3	489
Syria	10	175
China	29	629
Japan	26	366
India	34	5,812
Other Asia	21	1,998
Canada and Newfoundland	610	466
Cuba	3	162
Other West Indies	25	285
Mexico	16	25
Central America	5	476
South America	12	357
Africa	25	2,822
Australia	18	1,404
Azores and other Atlantic Islands	1	71
Pacific Islands	18	3,976
Puerto Rico, Hawaii, Philippines and Alaska	28	....

small. There is a tendency for the states of the West and Northwest to produce many men of science; but they do not retain them in competition with manufacturing states, nor attract them from other states or abroad. So Idaho, Montana, Oregon, South Dakota, Washington are above the median in births and below it or at zero in the other three. Colorado and Nebraska can be put into this group.

In general the states that produce do not retain, but Massachusetts, Ohio and Utah are notable exceptions. Attraction from other states and attraction from foreign countries show a surprising lack of correlation. Connecticut, Massachusetts and New York are very high in the former but at or below the median in the latter. Retention and attraction are also much less closely related than would be expected.

The correlation coefficients witness to the generally confused pattern of the states.⁴ They are as follows, all deviations being taken from the medians:

	Pearson coefficient	Sheppard coefficient	Average
Birth with retention	-.14	-.38	-.26
Birth with attraction from other states .....	.09	.20	.15
Birth with attraction from abroad	-.44	-.58	-.51
Retention with attraction from other states .....	.28	.43	.36
Retention with attraction from abroad .....	.21	.18	.20
Attraction from other states with attraction from abroad .....	.30	-.30	.00

TABLE 5

PERSONS IN "AMERICAN MEN OF SCIENCE" BORN IN THE 48 STATES OR D. C. REPORTED AS RESIDING IN ALASKA, HAWAII, ETC.

Alaska	1
Territory of Hawaii	83
Philippines	13
Puerto Rico	21
Virgin Islands	1
England	16
Scotland	1
Norway	1
Denmark	1
Belgium	1
Switzerland	2
France	10
Germany	5
Austria	1
Hungary	1
Yugoslavia	1
Russia	1
Rumania	1
Turkey	2
Italy	2
Syria	10
China	27
Japan	1
India	9
Other Asia	4
Canada and Newfoundland	106
Cuba	2
Mexico	8
Central America	12
South America	16
Africa	10
Atlantic Islands	1
Pacific Islands	5

⁴ They would be disturbed in any case by the skewness

Table 4 presents, for American men of science residing in the 48 states and the District of Columbia, the number born in each of various foreign countries and the proportion which this number is of the total number of persons born in that country and residing (in 1930) in the United States. These proportions (each of which is the number of American men of science from the country in question $\times 1,000,000$ divided by the total number of U. S. A. residents in 1930 from that country) are not measures of the contributions of the nations listed, because of differences in the times at which the immigrations occurred, in the proportions which the children of Americans temporarily abroad (as missionaries, government employees, etc.) are of

the numbers born in the countries in question, and in other respects. But they are instructive if used with wisdom and caution.

The men of science born in the 48 states and the District of Columbia who were reported as residing in Alaska, the Territory of Hawaii, the Philippines, Puerto Rico, the Virgin Islands and in foreign countries are enumerated in Table 5; but I am unable to estimate how many in any of the groups are permanently residents outside of the states.

The Cattell list includes 901 men of science residing in Canada. Of these 577 were born in Canada; 106 in the 48 states and D. C.; 110 in England; 30 in Scotland; 4 in Wales; 46 in other European countries.

OBITUARY

JOHN GERALD FITZGERALD

ON June 20, Dr. John Gerald FitzGerald, director of the Connaught Laboratories and of the School of Hygiene, University of Toronto, died in his fifty-eighth year. Dr. FitzGerald was internationally known as an authority on medical education, as a leader in preventive medicine, as a scientific investigator and as a director of medical research. As a result of his vision, initiative and leadership, there were established in the University of Toronto the Connaught Laboratories and the School of Hygiene. Returning to his alma mater in 1913 as associate professor of hygiene and preventive medicine, University of Toronto, he devoted himself to an endeavor to create, within this university, a non-commercial scientific institute to fulfil two functions in the interests of medical public-service, *viz.*, research in the field of preventive medicine, and the preparation of diphtheria antitoxin and certain other biological products so that these products might be supplied throughout Canada in such a fashion as would ensure their being of high quality and low price. His insistent perseverance soon yielded success in this endeavor, and the antitoxin laboratory which he established at that time, and which shortly became known as the Connaught Laboratories, later proved to be a major contributing factor in the establishment of a national School of Hygiene at the University of Toronto. The achievements of these two institutes, the Connaught Laboratories and the School of Hygiene, are due in no small measure to Dr. FitzGerald's constant encouragement and promotion of intimate relationships and integration among teaching, research and public-service activities.

Serving as a member of the International Health Board of the Rockefeller Foundation from 1923 to

1931, subsequently as a scientific director of the foundation's International Health Division, and as a member of the Health Committee of the League of Nations from 1930 to 1936, Dr. FitzGerald evidenced his keen interest in international public health. In 1933-34, he joined General F. F. Russell and Dr. W. W. Jameson in making, for the International Health Division of the Rockefeller Foundation, a survey of health conditions in India, Ceylon and Egypt. In 1936-37, at the instance of the Division of Medical Sciences of the Rockefeller Foundation and in company with Dr. C. E. Smith, he undertook a survey of the teaching of preventive medicine to medical undergraduates in Europe and North America. For four years, 1932-36, he served as dean of the Faculty of Medicine, University of Toronto.

He gave generously of his time to various important administrative and research undertakings in Canada—the Dominion Council of Health, of which he was one of the original members, the National Research Council of Canada, the Ontario Research Foundation and the Banting Research Foundation—and to various professional societies, including the Canadian Medical Association, the Canadian National Committee for Mental Hygiene and the Canadian Public Health Association. He was elected a fellow of the Royal Society of Canada in 1920 and was honored by Queen's University with the degree of LL.D. in 1925. He was one of the charter fellows of the Royal College of Physicians and Surgeons of Canada.

He made many contributions to scientific literature. To meet the needs of medical students he early published a "Laboratory Guide in Bacteriology," and later "An Introduction to the Practice of Preventive Medicine," an extensively used text-book.

Within and far beyond the institutes to which John Gerald FitzGerald devoted his life, his work will continue to live, and he will be remembered as one who

of the distributions, but if there were close resemblances in production, retention and attraction, the skewness would not reduce the coefficients greatly.

contributed richly to the advancement of public health throughout the world.

R. D. DEFRIES

RECENT DEATHS AND MEMORIALS

DR. STUART PRITCHARD, for the last ten years president and general director of the W. K. Kellogg Foundation at Battle Creek, Mich., an authority on tuberculosis, died on August 3 at the age of fifty-eight years.

DR. FRITZ SCHIFF, of the Beth Israel Hospital, New York City, died on July 30 at the age of fifty-one years. A correspondent writes: "Dr. Schiff, who was one of the outstanding bacteriologists in Europe, came to this country in 1936 and was appointed bacteriologist at the Beth Israel Hospital, New York City. He made important contributions to the subjects of the blood groups and the Salmonella group of organisms."

THE death is announced of Dr. Giuseppe Sanarelli, professor emeritus and formerly dean of hygiene and director of the Hygienic Institute of the University of Rome.

ACCORDING to the *Journal of the American Medical Association*, the old autopsy house of the Philadelphia General Hospital, where Dr. William Osler worked from 1885 to 1889, has been restored to be used as a museum of Osleriana. At the dedication in June eleven resident physicians who served with and under Dr. Osler were present, as was Dr. Howard A. Kelly, of Baltimore, the only living member of the group that served with Osler at the Johns Hopkins University. Dr. Joseph McFarland, who was resident physician at the hospital, then known as Blockley, in 1889, spoke on "Osler as I Knew Him," and Dr. William G. MacCallum, Baxley professor of pathology at the School of Medicine of the Johns Hopkins University, a former pupil, spoke on "Osler at Blockley." Other speakers were Dr. William E. Hughes, physician at the hospital from 1889 to 1914, now honorary consultant, and Dr. William E. Robertson, who paid tribute to Dr. David Riesman, one of those most active in the establishment of the memorial. Dr. Riesman died a week before the dedication. A painting of "Osler and Old Blockley," by Dean Cornwell, was unveiled.

SCIENTIFIC EVENTS

DISPERSAL OF SCHOOLS OF THE UNIVERSITY OF LONDON

THE report issued by the principal of the University of London for 1939-40 describes the dispersal of the schools of the university to Wales, Oxford, Cambridge, Bristol, Leeds and the Scottish universities. In an abstract published in the *London Times*, it is said:

The dispersal had been planned early in 1939, but it was complicated by the government's unexpected decision not to call up men under the age of 20, which resulted in some 80 per cent. of the normal complement of male students requiring accommodation, instead of 25 per cent. Thanks largely to the cooperation of other universities, the difficulties of dispersal were successfully overcome, but war conditions have inevitably thrown much additional work on the staff and officers. Examinations have been held, and there has been no lowering of the university standard. The only schools to return to London have been those of medicine, for the sake of their clinical centers.

The university is faced with the double prospect of diminished revenues and increasing expenses. The London County Council has reduced its grant by £8,600 for the year 1939-40; but almost all other grants from public bodies have been maintained. Private benefactions have been remarkably generous in the present circumstances; even the support granted by the Polish Government to the chair of Polish literature and history is being maintained. In spite of the withdrawal of a grant promised by the National Fitness Council towards the building of a new Students' Union, Lord Nuffield has decided to let his own grant for the same purpose stand.

The Ministry of Information has occupied the Senate House, but has left the senate room and libraries to the university. The building of the Great Hall, the School of Oriental Studies and Birkbeck College is proceeding.

There are 10,964 internal students reading for degrees and diplomas, as compared with 14,415 in 1939. An unexpected number of external students have enrolled, and, although extra-mural work has been drastically curtailed, extensive arrangements have been made for courses of instruction for troops, both in large camps and the smaller units.

University College and King's College have agreed, in view of the recent occupation by the government of the buildings of University College, that both colleges alike should continue to carry on their work in the universities and colleges to which they have been dispersed.

EXPEDITIONS OF THE AMERICAN MUSEUM OF NATURAL HISTORY

DR. WALTER GRANGER, curator of paleontology of the American Museum of Natural History, is continuing his more than forty years of exploration for fossil mammals with an expedition into the Big Badlands of western South Dakota this summer. He left New York on July 25 for the headquarters of the expedition in Rapid City, S. D., to join Albert Thomson, preparator in paleontology, and Junius Bird, assistant in anthropology. The main objective of the expedition is to collect specimens of the small, three-toed horse, *Mesohippus*, a rhinoceros that was smaller than any

of the species now living in Africa and Asia; various kinds of cats, especially the sabre-toothed tiger; and the remains of *Entelodon*, whose nearest living relative is the pig. In deposits of far more recent times, above these fossil beds, have been found interesting evidences that ancient Indians once occupied this same region. Mr. Bird will carry on excavations in an effort to discover more about their culture. Chalcedony tools, such as scrapers and knives, have already been found, as well as pieces of black pottery. The expedition will be in the field until November 1.

Dr. Barnum Brown, curator of fossil reptiles, left New York on August 3 to lead the American Museum-Sinclair Expedition of 1940 into the Big Bend region of southern Texas, near Marathon. The expedition will excavate remains of the largest dinosaurs yet found. These bones were discovered last summer by Dr. Erich Schlaikjer, during a reconnaissance expedition for the museum. Dr. Schlaikjer and Roland T. Bird, preparator in paleontology, will join Dr. Brown in Marathon to assist in digging the bones out of the rock and preparing them for shipment.

Dr. Grace Fisher Ramsey, associate curator of the department of education, left New York on August 8, to conduct a study of the lives and work of Indian artist craftsmen in Mexico. She will also make color motion pictures of life in Mexican villages and collect materials which can be circulated from the department of education among schools and other institutions. These collections will be representative of the native crafts of the Mexicans of central, southwestern and southeastern Mexico and will include types of weaving in wool, cotton and various plant fibers; embroidery, drawnwork and beading; pottery to show regional designs; all types of metal crafts in silver, copper and tin; leather and lacquer work; masks, musical instruments and toys. Dr. Ramsey will be accompanied on the journey by Herman Sievers, staff assistant in education, Mrs. Sievers and Miss Ethel Fisher. Almost the entire trip will be made by automobile. The expedition will return to New York in the latter part of September.

Theodore A. McGraw, of Grosse Pointe, Mich., will lead an expedition in the Wrangel Mountains of Alaska. He will be accompanied by T. Donald Carter, assistant curator of mammals, who left New York on August 1. The purpose of the trip is to make a general collection of the mammals in this region, ranging from mice to grizzly bears, for the study collections. Work will continue until the first snowfall, and Mr. McGraw and Mr. Carter expect to return by the first part of October.

Dr. John E. Hill, assistant curator of mammalogy, is now making collections of small mammals in the southern part of Kansas. This work is of interest to the museum as part of its survey of animal life in the

dust-bowl section; to determine what animals have been exterminated or driven out by drought and changing vegetation and those animals still remaining, which have survived these changes. Mrs. Hill and Peter Crow, of Cornell University, are assisting Dr. Hill. The expedition will be in the field until the middle of September.

THE NEW YORK ZOOLOGICAL SOCIETY

At a special meeting on June 25 of the Board of Trustees of the New York Zoological Society, Fairfield Osborn was elected president to succeed W. Redmond Cross, who resigned in June. Mr. Cross had been president of the garden and chairman of the executive committee since 1937. Laurance S. Rockefeller was elected chairman of the executive committee, Mr. Cross remaining as chairman of the Board of Trustees. Mr. Rockefeller was also elected second vice-president of the board. The position of secretary, left vacant by Mr. Osborn's election to the presidency, will be filled later.

In a statement made by Mr. Osborn he said in part:

The institutions operated by this society are visited annually by an immense public, equivalent numerically—not allowing for repeat visitors—to approximately four per cent. of the total population of the entire nation. This fact is more than a call for continuance as we are now; it is a direct challenge to us constantly to broaden and vitalize our contacts with the public. These contacts call for creation of advanced methods of exhibiting our unrivaled living collections, for highly efficient park and building administration, for advancing our education and conservation activities, and, back of the scenes, for pressing forward with research work in the laboratories at the Zoological Park and the Aquarium, this work, in many of its phases, contributing directly to the solution of human disease problems.

In regard to the activities of the society, it is announced that a contract has been let for construction of the African Plains exhibit in the Zoological Park—work on which was started on July 22. This development has been made possible by a member of the society who wishes to remain anonymous. Plans have been drawn for a new aquarium; important new exhibition units are in plan or at the point of construction for the aquarium in its present building, and the program of research, including phases of it bearing on human health problems, is now more active than at any time since the society was formed.

Some time ago the Rockefeller Foundation made a grant to the Zoological Society for the study of methods of production of films on zoology and allied subjects. It is hoped that this study will lead to the actual production of films. One script, on the life cycle of the eel, has already been prepared; three

others are in preparation, on bird migration, the continental distribution of animals, and adaptation of form to movement.

With the advantage of its background, its great collection of wild animals, its scientific staff, its laboratories and its technical publication, the trustees plan to expand the scientific work of the society.

The retirement of Dr. W. Reid Blair as director of the Zoological Park on May 1 left a vacancy which was filled temporarily, at a meeting of the Board of Trustees on July 15, by the appointment of H. R. Mitchell as acting director. As already announced in *SCIENCE*, Allyn R. Jennings, general superintendent of the Park Department, was appointed general director of the Zoological Park and the Aquarium, and Harry Sweeny, Jr., director of parks in Queens and Manhattan, was appointed assistant general director.

Under the new form of management, Mr. Jennings will have general charge of operations both at the Zoological Park and the Aquarium. Dr. Charles M. Breder, Jr., continues as director of the aquarium but will be freed to a considerable degree of administrative duties, giving him more time to spend on scientific work.

SYMPOSIUM ON NEW TEXTILES OF THE AMERICAN CHEMICAL SOCIETY

A SYMPOSIUM on "New Textile Fibers, Fabrics and Finishes" will be held in connection with the hundredth meeting of the American Chemical Society in Detroit, September 9 to 13. Dr. Gustavus J. Esselen, president of Gustavus J. Esselen, Inc., Boston, has been appointed chairman of the symposium, sponsored by the Division of Industrial and Engineering Chemistry. Ten authorities in the field will deliver addresses.

Kenneth H. Barnard, of the Pacific Mills Print Works, Lawrence, Mass., will describe recent progress in textiles in New England. Pointing out that chemistry was largely responsible for taking the textile industry out of New England and transplanting it in the South, he will report how research, new uses, faster colors and modern finishes for textiles are overcoming the economic handicaps of the Northeastern region.

Robert Boyer, of the Ford Motor Company, will discuss "The Experimental Production of Fibers from Soybean Proteins." Dr. F. Bonnet, director of textile research and the standards laboratory of the American Viscose Corporation, will describe "vinyon," a copolymerized vinyl resin made of vinyl chloride and vinyl acetate. Vinyon yarn, largely utilized in industrial filter cloth, will invite many other uses because of its remarkable properties, including resistance to strong acids and alkalis at ordinary temperatures. It is asserted to be practically water-repellant and as strong when wet as when dry.

Dr. G. P. Hoff, director of nylon research of E. I.

du Pont de Nemours and Company, will speak on "Nylon as a Textile Fiber." Dr. Games Slayter, of the Owens-Corning Fiberglas Corporation, will outline in what ways fiberglas, a new basic raw material, is being employed.

Dr. D. H. Powers, of the Röhm and Haas Company, Philadelphia, will show how synthetic resins for textile fabric modification improve the tensile strength, resilience, durability, luster and firmness of the fabrics without altering surface appearance, imparting to vegetable fibers many of the properties of animal fibers.

The forms, properties and uses of the cellulose acetate rayons will be the topic of Dr. Harold DeWitt Smith, of A. M. Tenney Associates, New York. Acetate rayons, according to Dr. Smith, account for approximately 30 per cent. of the total rayon production.

F. C. Atwood, of Atlantic Research Associates, Newtonville, Mass., will read a paper on "Protein Fibers." Electrocoated pile fabrics will be described by N. E. Oglesby and L. E. Hoogstoel, of the Behr-Manning Corporation, Troy, N. Y. To date, two types—dress goods and all-over covered pile material for upholstery—of textile products employing the electrostatic process are being manufactured commercially. The distinctive feature of a pile fabric manufactured by the electrostatic process is the density of pile attainable. This density is reflected in the wearing properties of the product.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

BEGINNING in September, each of the seventy-one local sections of the American Society of Mechanical Engineers in the principal industrial areas of the nation will sponsor several local meetings on the engineering problems of national defense and invite those present to make recommendations for their solution.

The parent society is planning a series of national regional meetings which will bring together the outstanding engineers and manufacturing executives of the country to discuss the engineering phases of the various elements of defense. It has announced the following dates and places for these meetings:

September 3 to 6, 1940—Fall meeting, Hotel Davenport, Spokane.

November 7 to 9, 1940—Joint American Society of Mechanical Engineers-American Institute of Mechanical Engineers meeting on fuels, Hotel Tutwiler, Birmingham.

December 2 to 5, 1940—Sixty-first annual meeting, Hotel Astor, New York.

April 1 to 3, 1941—Spring meeting, Atlanta.

June 16 to 20, 1941—Semi-annual meeting, Kansas City.

October 12 to 15, 1941—Fall meeting, Louisville.

The Inland Empire Section of the society has ex-

tended an invitation to mechanical, civil, electrical and mining engineers to attend the autumn meeting at Spokane.

Twenty-eight papers are announced for presentation at thirteen simultaneous technical sessions to be held on Tuesday, September 3, and Thursday, September 5. Twelve of these papers will cover the design, construction, mechanical equipment and potential uses of the Grand Coulee Dam, the world's largest masonry structure. Other subjects to be discussed include hydraulic problems, deep-well pumps, wood-working, coal, kiln drying, wood-waste utilization and material handling in the lumber industry.

Two luncheons, one dinner and a banquet are part

of the program. At the luncheon on Tuesday, L. V. Murrow, Washington Toll Bridge Authority, speaks on the "Lake Washington Pontoon Bridge." At the dinner on Tuesday, Major S. E. Hutton and F. A. Banks discuss the "Columbia Basin Reclamation Project." Following the luncheon on Thursday, Sid Jenkins will describe "One Hundred Years of Logging in the White Pine Forests of Idaho." The speaker at the banquet on Thursday evening will be R. L. Neuberger, author of "Our Promised Land." Trips on Wednesday and Friday will be made to the Grand Coulee Dam, a lumber mill in Lewiston, Idaho, the Coeur d'Alene mining district and local plants of interest.

SCIENTIFIC NOTES AND NEWS

IN recognition of "distinguished contributions to the science of genetics" two honorary degrees were conferred at commencement on Dr. George H. Shull, professor of botany and genetics at Princeton University. He received the degree of doctor of science from Lawrence College and the degree of doctor of laws from Antioch College, from which he graduated in 1901.

HONORARY fellowship of the Royal Society of Medicine, London, has been conferred upon Dr. Mervyn H. Gordon, Sir Leonard Rogers, C. H. Usher, Dr. Louis Martin, Paris; Professor Felix Nager, Zurich; Professor G. Roussy, Paris, and Dr. Ralph Pemberton, professor of medicine in the Graduate School of Medicine of the University of Pennsylvania.

DR. FRANK H. BETHELL, of the University of Michigan, has received one of the two annual Henry Russel awards for his "direction of field studies of anemias of pregnancy in Hillsdale County" in cooperation with the W. K. Kellogg Foundation.

THE Heberden Society has awarded the Heberden Medal for 1939 to Major W. S. C. Copeman for his paper entitled "Notes on Treatment of the Rheumatic Diseases in the British Expeditionary Forces."

DR. GEORGE W. CRILE, emeritus professor of clinical surgery at the Medical School of Western Reserve University, has been made an honorary member of the Academy of Medicine at Cleveland.

At the time of the annual meeting of the American Surgical Association at St. Louis, there was founded a new organization, designed particularly for the closer association of the younger surgeons of the Middle West and adjacent Canadian provinces. This is to be known as the Central Surgical Association. The officers elected at the organization meeting were: *President*, Dr. Roy D. McClure, of Detroit; *Presi-*

dent-elect, Dr. Grover C. Penberthy, of Detroit; *Secretary*, Dr. George M. Curtis, of Columbus; *Treasurer*, Dr. Max Zininger, of Cincinnati; *Recorder*, Dr. Henry K. Ransom, of Ann Arbor, and *Councillors*, Drs. Willis D. Gateh, of Indianapolis; Kellogg Speed, of Chicago, and Carl H. Lenhart, of Cleveland. The organization was further developed during the annual meeting of the American Medical Association in New York City. Its first regular meeting is to be held during the latter part of February next at the university hospital at Ann Arbor, Mich.

PROFESSOR H. H. NEWMAN, for twenty-nine years a member of the department of zoology of the University of Chicago, will become professor emeritus on October 1.

DR. ROGER B. CORBETT, dean and director of the College of Agriculture of the University of Connecticut, has been named director of the Agricultural Experiment Station of the University of Maryland to succeed Professor J. E. Metzger, who died last winter.

DR. CHARLOTTE HAYWOOD, associate professor of physiology at Mount Holyoke College, has been appointed chairman of the department of physiology, succeeding Dr. Abby Turner, who has retired.

DR. MARTIN SCHWARZSCHILD, of the Harvard College Observatory, has been appointed lecturer in astronomy at Columbia University.

J. C. CROCKER, senior lecturer, has been appointed head of the department of chemistry of the Chelsea Polytechnic, London, to succeed C. Dorée, who, after serving for sixteen years, will retire on August 31.

THREE of the five members of the faculty of Adelphi College, Garden City, Long Island, who were dismissed last spring, are bringing damage suits of \$20,000 each against the college administration. It is stated by the

authorities of the college that a general reorganization was made necessary at that time by a financial crisis in the institution. Those bringing suit are: William A. Colwell, head of the department of German for twenty-six years; Dr. Donna Fay Thompson, head of the department of sociology, who had been on the staff for sixteen years, and Dr. Edna Mosher, professor of biology since 1923, who had been head of the department for fifteen years.

THE newly elected president of the Chicago Museum of Science and Industry, Lenox R. Lohr, has made drastic changes in the staff, effective on August 15, by dropping heads of departments, some of whom had been with the museum ten years or longer. They are: Trent E. Sanford, architecture and civil engineering; C. Robert Moulton, chemistry; F. C. Brown, physics; J. A. Folse, power; R. B. May, transportation; Mary B. Day, library; Eric Fenger, staff engineer; E. C. Rauschenberg, superintendent of shops, and J. A. Maloney, public relations.

DR. BRUNO GEBHARD, formerly curator of the Museum of Hygiene in Dresden, has been appointed director of the Cleveland Museum of Health and Hygiene, which will open in October. Since 1937 Dr. Gebhard has been serving as technical consultant for the medicine and public health exhibits at the World's Fair in New York. Plans for the Cleveland Museum were initiated in 1939 when Mrs. Francis F. Prentiss gave the building and the Cleveland Academy of Medicine carried out a campaign for supporting memberships. In addition to exhibits for education in public health, the museum expects to have workshops for the creation of visual health aids for schools, colleges and other educational agencies.

DR. BERNARD WITLIN has resigned his positions as instructor of bacteriology at the Philadelphia College of Pharmacy and Science and as research bacteriologist at the Mulford Biological Laboratories of Sharp and Dohme, Inc., to become a member of the newly organized Barlin Laboratories at Philadelphia, Pa.

DR. R. RUGGLES GATES, professor of botany at the University of London, arrived in the United States on July 29. He is on leave of absence without salary for the duration of the war. Dr. Gates is working at the Marine Biological Laboratory at Woods Hole before going to Canada, where his address will be Middleton, Nova Scotia. He expects to be available for lectures during the coming academic year.

DR. EARL H. MYERS, who for the past two years has been working on a John Simon Guggenheim Foundation fellowship, has been awarded the Rumphius fellowship from the Treub Laboratories of the Dutch East Indies. This fellowship has been granted to continue investigation of the life cycles and ecological

relationships of the Foraminifera. Dr. Myers plans to return to America in December.

DR. L. G. M. BAAS-BECKING, formerly of Stanford University and now director of the 's Lands Plantentuin te Buitenzorg, was called back to Holland in March, and was there when the low countries were invaded. A telegram has been received stating that he is alive and well.

THE National Research Council Committee on Human Heredity has at its disposal certain funds for use in furthering studies in human inheritance. Qualified persons are invited to submit requests for grants where needed to initiate or to continue research in this field. Requests should be sent as soon as possible to any member of the committee, and should include a clear statement of the problem, results already achieved, if any, the approximate time required to finish the problem, the amount of money needed and a statement as to how the money will be spent if granted. The committee consists of Halbert L. Dunn, Bureau of the Census, Washington, D. C.; L. C. Dunn, department of zoology, Columbia University; K. S. Lashley, department of psychology, Harvard University; George L. Streeter, bureau of embryology, Carnegie Institution of Washington, Baltimore, Maryland; Sewall Wright, department of zoology, University of Chicago, and Laurence H. Snyder, *chairman*, department of zoology, the Ohio State University.

THE second International Congress of Pure and Applied Science, which it was planned to hold at Columbia University in September, has been postponed. As soon as possible new arrangements will be made for the meeting.

DR. O. A. DRUMMOND, plant pathologist of the School of Higher Agriculture at Estado de Minas Gerais, Vicosia, Brazil, writes to the secretary of the American Association for the Advancement of Science that students or investigators from the United States, who may care to spend some time in that region, will be welcomed at the school.

THE University of Berne, Switzerland, has announced its annual prize for work on encephalitis lethargica which "signifies real progress in the diagnosis or treatment of the disease." Applications should be sent to the dean of the Medical Faculty.

FOR the academic year 1940-41, the Abbott Laboratories have established fellowships in several universities. The fellowships, carrying stipends of \$650 per year, will be available to graduate students in the last or next to last years of graduate work leading to the doctorate degree. The recipients, who are to be selected by the universities in which their work is

being done, are not limited as to the subjects on which they will work. Grants will be made in organic chemistry at Cornell, Harvard, Illinois, Michigan and Northwestern Universities; in biochemistry at California, Columbia and Cornell Universities.

ACCORDING to *The Collecting Net*, the number of investigators in each academic rank registered this summer at the Marine Biological Laboratory at Woods Hole, Mass., is: Professors, 63; associate professors, 19; assistant professors, 60; instructors, 46; research associates, 10; assistants, 71; fellows, 22; graduate students (not listed elsewhere), 27; medical students, 8; undergraduate students, 7; preparatory students, 3; miscellaneous, 22. The four institutions leading in providing investigators for the laboratory are: Pennsylvania, 34; Columbia, 20; New York University, 16, and Chicago, 11.

FOSSIL camels from South Dakota have been collected by an expedition of the Field Museum of Natural History. The camels lived in that state during the Miocene age, about 18,000,000 years ago. They form part of a collection which gives promise of being one of the best representations of fossil animals from the Rosebud Beds in South Dakota, according to Paul O. McGrew, of the paleontological staff, who is the leader of the expedition. Other specimens include a large number of skeletons and skulls of the extinct ungulates known as oreodonts, extinct peccaries and horses. Also included is an especially fine representation of extinct species of rodents, some of which are believed to be of kinds hitherto unknown to science. Nearly all the material obtained represents mammals not previously represented in the collections of the museum.

Nature states that the British Minister of Labor and National Service has made an order for the compulsory registration of professional engineers. It refers to those who are normally engaged in a technical or su-

pervisory capacity in aeronautical, automobile, chemical, civil, structural and municipal, electrical, gas, locomotive or mechanical engineering; and those normally engaged on research work in the engineering sciences at a university or in research and development work in any industry or as a teacher of engineering science. Men whose names are already on the Central Register are not to register again. There are 22,000 names in the engineering categories of the register, of whom about 800 are not in employment, and it is estimated that 30,000 more names will be added.

THE London *Times* announces that Lord Perry, chairman of the Ford Motor Company, with the approval of the British Ministry of Agriculture, the Henry Ford Institute of Agricultural Engineering, at Boreham, near Chelmsford, is offering 40 free scholarships for the training of British boys for careers in agriculture. The scholarships comprise 10 that are tenable for three years, 10 for two years and 20 for one year. Each is valued approximately at £175 a year, which includes cost of tuition; board and residence during terms at Boreham House, near the Fordson estates; laundry; pocket money during terms and holidays; special clothing and boots. The cost, estimated at £7,000 a year, is to be defrayed by Henry Ford. The intention is to provide theoretical and practical instruction in the latest methods of every branch of farming, with classroom tuition and field work in alternate months, in order to train the boys to become key men in British agriculture. The estates attached to the institute cover 4,000 acres, and are devoted to corn crops, intensive market gardening, glasshouse culture, a fruit section with gas storage and the care of 2,000 pigs, 700 sheep and 200 dairy cattle. Applicants for scholarships will be required to attend the institute for a probationary period of one month, during which the final selections will be made of the prospective recipients.

DISCUSSION

INSECT CULTURES INBRED FOR 200 GENERATIONS

IN our insect-rearing laboratory at the Ohio State University we now have cultures of the blowflies *Lucilia sericata* and *Phormia regina* which have been inbred for ten years or approximately 200 generations. These cultures have lost nothing in vigor and are well adapted to laboratory rearing and uses.

In 1930 the Division of Insects Affecting Man and Animals of the U. S. Bureau of Entomology decided to make a study of blowfly maggots which were useful in the treatment of certain types of infections, especially osteomyelitis. In June of that year I was

invited to Washington, D. C., to begin the first steps of this work. Cultures of blowflies were being maintained at that time at the Naval Hospital in Washington and at Children's Hospital School in Baltimore, where the treatment had originated under Dr. Wm. S. Baer. These cultures consisted of a mixture of species of flesh flies obtained by placing bait out of doors and collecting eggs. Consequently, one of the first necessary steps was to establish pure cultures of known species of flies.

At that time cultures of three species were started. One was the species *Calliphora erythrocephala*, which was later discarded because it was found to be less satisfactory for clinical use. The other two species

were *Lucilia sericata* and *Phormia regina*. The *Lucilias* were started by the capture of a single female fly which deposited a small cluster of eggs, thus producing the first cage of stock. These related individuals were then inbred to continue the culture. The *Phormias* were established three months later. From this original stock, material was transferred to our laboratory at the Ohio State University in October, 1930, and have been maintained by inbreeding continuously ever since.

Among the early problems that had to be settled were those of food and rearing, such as failure to pupate and the loss of adult flies from bloating. After trying many foods such as fruits and fruit juices, honey and sugar solutions, and a wide variety of meats for both the adults and maggots, the following simple foods were chosen.¹ Adults were fed lean beef, which was essential to egg development in females, and brick sugar. Fresh tap water was supplied at all times. The maggots were fed fresh hamburger. No other food has been used over a period of eight years. The cultures have flourished and selective measures seem to have eliminated the rearing difficulties mentioned. The flies have been very useful for research on osteomyelitis, insect physiology, insecticide testing and as class material.

D. F. MILLER

THE OHIO STATE UNIVERSITY

SPONTANEOUS ACTIVITY OF THE SPINAL TADPOLES OF THE FROG AND THE TOAD

IN connection with our work on the development of swimming and righting reflexes in the tadpoles of the frog (*Rana guentheri*) and the toad (*Bufo bufo asiaticus*) and the effects thereon of the transection of the central nervous system at different levels about the time of hatching, we were surprised to find that spinal tadpoles show spontaneous activity. This is entirely contrary to what is observed in spinal frogs and toads, which hardly ever make any movement when not externally stimulated.

Decapitated tadpoles, tadpoles with only a small caudal fragment of the spinal cord intact, all move about without any noticeable external stimulation. These spontaneous movements come periodically—occurring every five to ten minutes, or every twenty to thirty minutes, or one to one and a half hours. The active period lasts from one second to one minute. Lack of suitable recording instruments prevented us from taking some accurate continuous records of this spontaneous motility from the time after operation to the time of the death of the animal.

Further destruction of the remaining spinal cord abolishes the spontaneous activity.

¹ James Godfrey Haub and David Franklin Miller, *Jour. Exp. Zool.*, 64: 52-55, November 5, 1932.

It is extremely difficult to rear these spinal specimens, and therefore it is not as yet possible to ascertain whether they still show spontaneous motility after metamorphosis.

This striking difference in the behavior of the tadpole and the adult form of the frog and the toad after the removal of the brain leads us to ask how it comes about. Might not the spinal centers of the adult have become so accustomed to take orders from the higher centers that they lose their own initiative?

GING-HSI WANG
TSE-WEI LU

INSTITUTE OF PSYCHOLOGY,
ACADEMIA SINICA,
KWEILIN, KWANGSI, CHINA

THE CASE HISTORY OF A SCIENTIFIC NEWS STORY

ON August 21, 1937, the United States National Museum published a bulletin written by me and entitled "The Fort Union of the Crazy Mountain Field, Montana, and Its Mammalian Faunas." Highly technical in character, this publication of 287 pages describes the geology and paleontology of Middle and Upper Paleocene strata in central Montana. As is their custom, the officials of that museum released to the press a non-technical résumé of this publication. The release was submitted to me for approval and was issued only after revision seemed to leave no possible false impression. It was a rigidly correct and yet easily comprehensible summary carefully avoiding any sensational claims or mis-statements. My own institution, the American Museum of Natural History, was mentioned in the story and its clipping service sent in versions of this story as it appeared in ninety-three different papers from Maine to California and from the Great Lakes to the Gulf of Mexico.

Six papers, from such cities as Worcester, Mass., and Butte, Montana, published the release almost exactly as it was written. Less than one fourth of this version refers to the oldest known primates, included in the faunas described in the bulletin. The bulletin and the original release emphasize that these are not in a direct line of modern primates or man, but that they are very ancient representatives of the same broad group of mammals. They also point out that it was not I who discovered these ancient primates. Even in the reprints of the whole release a few errors crept in, among them a statement that the fossils in question are 70,000,000 years old, a considerable exaggeration. The headlines were innocuous, although the Butte, Montana *Standard* spread across three columns "Montana's Crazy Mountains Listed as Cradle of Animal Life to Which Man Belongs," which escapes falsity largely by being nonsensical.

The sedate *New York Times* rewrote the story as a

"special," and their version appeared without much change in twenty-nine newspapers. This was a skillful and generally accurate condensation of the original press release to about a third of its original length. The text of this dispatch carefully points out that the primates discussed are not ancestral to living primates or to man, and yet the *Times*' own headline was "Man 'Traced' Back 70,000,000 Years," and the other papers all followed suit, with even less restraint. This story, too, refers to 70,000,000 years, although in a later paragraph it gives the much lower figure that I really authorized. Writing a special article for the *Washington Star*, Mr. Thomas R. Henry was irked even by the larger figure and changed it to "seventy or eighty million years ago," presumably on his own authority.

The Associated Press used the release as basis for a rewritten and much modified dispatch that appeared in thirty-four papers. The tone of this is set by its first sentence: "Man, instead of having descended from the monkey, probably ascended from a four-inch long, tree-dwelling animal which was the ancient granddaddy of all mammals on earth to-day." It went on to suggest that I held that man might have originated in the western United States rather than in Asia. It may not be necessary to insist that I have never made and do not believe any such statements as these or others of less importance in the same dispatch. The headline writers outdid themselves on this version of the story:

Monkey Father of Man? Nope, a Mouse.—Sacramento, Calif., *Union*.

4-inch Fossil Seen as Daddy of All Mammals.—Richmond, Va., *Times-Dispatch*.

Four-Inch Tree Animal Seen as Man's Ancestor.—Shreveport, La., *Times*.

Here's New Kind of Monkey Story.—Lynchburg, Va., *Advance*.

Study of Mammals Brings about New Evolution Theory.—Newport News, Va., *Press*.

Western U. S. Now Held to be Man's Birthplace.—Tacoma, Wash., *Ledger*.

The United Press dispatch, appearing in some cases with Mr. Hillier Kriehbaum's by-line, has been clipped from twelve papers. This story, happily for me, steered clear of the subject of man's ancestry and emphasized the survival of mammals after the dinosaurs became extinct. The story is well written, reasonably accurate, and interesting, so that it would be ungrateful to insist too much on the fact that it has very little to do with the particular research to which it refers. There is not much snappy headline material here, and the best, or worst, they could do was "Mice of 70,000,000 Years Ago Outlast the Dinosaurs." Incidentally, the recurrent theme of rats and mice in these various versions is the result of saying that some

of these early mammals were as small as rats and mice. Of course they were not rats or mice, nor was such a statement made in the original release.

Mr. David Dietz, the Scripps-Howard science editor, made by far the best condensation and rewrite of the story, giving a good idea of the essential meaning of the work and a brief but fair summary of its results. Unfortunately, this account appeared in only two newspapers, as far as our clippings show. The New York *World-Telegram* headed the story chastely "Primeval Life in America." *Science Service*, quoted by four papers, also produced a reasonable account, although one slightly less accurate and much less enlightening than that by Mr. Dietz.

Only four papers seem to have written their own unsyndicated accounts. Apparently these were based without credit on the garbled Associated Press version, which of course they garbled still farther. Two of them, like several that used credited press services, have me discovering the missing link. A story in the Philadelphia *Record* contains just four sentences, not one of which is even roughly true, either as scientific statement or as the quotation from me that it purports to be. Unfortunately, they did spell my name correctly, so that it is clearly I who am represented as "clambering about man's family tree" whence I announce that a "tiny rat is latest ancestor of man."

This furore died down in October, 1937, and I sighed in relief and set about trying to live down the newspapers' ideas of what I had said. Then on April 18, 1938, the Gloversville, N. Y., *Leader* published an account of the Mohawk Valley Kennel Club's show in the course of which they gave me (under a wrong but all too recognizable name) as authority for the existence 70,000,000 years ago in Montana of dogs as large as Kodiak bears. Then another town had a dog show, and this time it appeared that I had not only discovered such dogs but had described sixty different species of them. This is appalling fertility of imagination, for the original release contained no mention whatever of the discovery of dogs, whether as large as Kodiak bears or as small as mice. Dog fanciers and newspaper exchanges being what they are, I subsequently enjoyed another period of fame, this time as the discoverer of the great, 70,000,000 year old Kodiak-bear-dogs, which no more existed and which are no more my invention than the rats ancestral to man. Years after the original press release, this truly ridiculous story is still occasionally appearing.

For some time I received letters from all over the country, all beginning in essence "I see by the papers where you say—" and then going on to vilify or, less commonly, to praise me for things that I never have said and never would say. These letters have little to do with the case, but they do show that people were

interested and in many cases excited by the newspaper accounts. This is hopeful, because it suggests that even the truth might have interested them had the press seen fit to make it available.

Out of nearly one hundred papers whose stories finally came back to me, about one tenth had reports that were neither seriously wrong scientifically nor obnoxious to me personally. In view of the great need

for popular presentation of the results of research, and in view of the mechanisms set up for this purpose and used in this case, this is a serious matter despite its humorous side. It is fairly typical of what still happens to scientific news, and it has a moral, in fact several of them, that will be obvious to the reader.

G. G. SIMPSON

THE AMERICAN MUSEUM OF NATURAL HISTORY

SOCIETIES AND MEETINGS

THE EASTERN SECTION OF THE SEISMOLOGICAL SOCIETY OF AMERICA

THE Eastern Section of the Seismological Society of America held its fifteenth annual meeting on May 31 and June 1, 1940, at Xavier University, Cincinnati, Ohio. The sessions were well attended, and all the prominent seismological observatories of the United States westward to the Mississippi Valley were represented; on account of the international situation, the Canadian seismologists did not attend. The members and guests of the section were welcomed by the Reverend Dennis Burns, S.J., president of Xavier University, and by the Reverend V. C. Stechschulte, S.J., director of the Xavier seismic station.

Professor Arthur C. Ruge, of the Massachusetts Institute of Technology, chairman of the section, presided at the four sessions during which the business of the section was transacted and the scientific papers were presented. Detailed reports were given on "Amateur Seismology" by J. J. Lynch, S.J., of Fordham University, and on "Methods and Operations" by E. L. Perry, of Williams College; these reports aroused much interest and discussion; it is hoped that they may be made available in printed form for distribution. The report of E. A. Hodgson, of the Dominion Observatory at Ottawa, on "Vault Construction" was read by title because of his enforced absence; however, the detailed report has since been mailed by the observatory to all seismic stations; it constitutes the most authoritative and up-to-date source of information that we have on the subject.

Twenty-two papers were presented on a variety of topics in theoretical and instrumental seismology. Captain N. H. Heck, of the U. S. Coast and Geodetic Survey, discussed recent developments in strong motion recording and showed excellent records of the Imperial Valley earthquake which had occurred a few days before the meeting; he gave interesting details of the effect of the European war on international scientific societies. Other papers of particular interest were: "Observations of Microseisms at Spring Hill College, Alabama," by A. J. Westland, S.J., and C. J. Elliot, S.J., of Spring Hill College; "The Earthquake Analyzer," by Arthur C. Ruge, of the Massachusetts Institute of Technology; and "A 'Synchronous Direct Cur-

rent Motor' for Seismograph Recorders," by J. H. Nelson, of the U. S. Coast and Geodetic Survey. Two topics were discussed at length by the entire section; H. E. McComb, of the U. S. Coast and Geodetic Survey, led the discussion on "Instruments," and J. B. Macelwane, S.J., led that on "Seismic Prospecting." The leaders had prepared carefully questions and arguments on theoretical and practical aspects of seismology that provoked extended and at times heated debate.

The following officers were elected unanimously for next year: *Chairman*, A. J. Westland, S.J., Spring Hill College; *Vice-Chairman*, R. R. Bodle, U. S. Coast and Geodetic Survey; *Secretary*, W. A. Lynch, Fordham University; *Treasurer*, H. Landsberg, Pennsylvania State College; *Fifth Member of the Executive Committee*, A. C. Ruge, Massachusetts Institute of Technology. An important resolution was adopted requesting the Electric Utilities of the United States to aim at closer frequency control to assist observatories and other scientific bodies in making time measurements.

An excellent luncheon served on Saturday by Xavier University provided a fitting close to a thoroughly enjoyable and instructive meeting.

WILLIAM A. LYNCH,
Secretary

FORDHAM UNIVERSITY

THE BOTANICAL CONFERENCE AND FORAY AT THE ALLEGANY SCHOOL OF NATURAL HISTORY

A TOTAL of eighty naturalists participated in the botanical forays held at the Allegany School of Natural History over the week-end of June 21-23. The following societies were represented: Botanical Society of America, American Society of Plant Taxonomists, Torrey Botanical Club, Burroughs-Audubon Club of Rochester, Nature Sanctuary Society of Western New York, Western Pennsylvania Botanical Club and Sullivant Moss Society. The conference attracted botanists from a widely scattered area, including South Dakota, Wisconsin, Ohio, Tennessee, Pennsylvania, New York, New Jersey and Massachusetts.

The program started with a dinner at the school on Friday evening, followed by two illustrated lectures in the Assembly Hall. Dr. William N. Fenton, associate anthropologist of the Bureau of American Ethnology, Smithsonian Institution, Washington, D. C., spoke on the subject, "Ethnobotanical Remains among the Senecas." He discussed the use of native plants in primitive medicine, religious ceremonies and aboriginal industries. A. F. Hough, assistant silviculturist of the Allegheny Forest Experiment Station, Philadelphia, Pa., delivered the second lecture, "Research Projects in the Allegheny National Forests." Both talks were based on prolonged technical studies and were greatly appreciated by the audience of about fifty persons.

Saturday morning was devoted to a foray on Jones Hill, south of Steamburg, N. Y., about fifteen miles from the school. Steamburg lies in the terminal moraine of the last glaciation, and the upper slopes of Jones Hill were unglaciated. An unusual variety of vascular plants were found in this one locality. Splendid views of the surrounding country rewarded those who reached the top.

At noon the caravan followed New York State Route 17 along the picturesque Allegheny River Valley for nearly twenty-five miles to St. Bonaventure. Arrangements for luncheon had been made through the kind offices of Professor Hubert Vecchierello, head of the biology department at the college. The medieval atmosphere of the huge refectory and the tour of the splendid romanesque library will not soon be forgotten.

Later the party returned to Steamburg to visit a bog in the terminal moraine area. All five of the native coniferous trees, tamarack, black spruce, balsam fir, white pine and hemlock, were found. Of special interest was the discovery of *Arisaema stewardsoni* at Chamberlain's Bog by Dr. Norman C. Fassett.

After dinner at the Allegany School the evening of Saturday was spent informally with the library and laboratories of the school open to the guests so that finds of the day could be examined and discussed. Some enthusiasts worked until after midnight arranging their collections.

Short forays designed to accommodate special interest groups were held on Sunday morning. W. Burdett Moose, high-school principal of Coudersport, Pa., led the Fern Foray to South Mountain and Sheffield Hill. Dr. Robert B. Gordon, of the State Teachers College at West Chester, Pa., and L. K. Henry, of the Carnegie Museum at Pittsburgh, led another foray through the mature forest area known as Big Basin for the benefit of forest ecologists and mycologists. A general botanical foray to Bear Bog was led by Homer A. Jack, of Cornell University. Dr. R. H. Goodwin, of the University of Rochester, Dr. Norman C. Fassett, of the University of Wisconsin, and Dr. Earl E. Sherff, of the Chicago Teachers College and Field Museum, were among the able participants who assisted. A fourth foray was planned for the bryologists and lichenologists, with Olean Rock City as their destination. Dr. Margaret Fulford, of the University of Cincinnati, Dr. P. Boehner, of St. Bonaventure College, and Mr. and Mrs. Warren Bleekman, of Buffalo, N. Y., furnished leadership.

The conference closed on Sunday with a dinner at the Allegany School. Chauncey J. Hamlin, president of the Buffalo Society of Natural Sciences, made a presentation speech awarding the Pugsley Bronze Medal to William P. Alexander, curator of adult education at the Buffalo Museum, for his pioneer work in establishing the first nature trail in the Allegany State Park in the summer of 1921.

ROBERT B. GORDON,
Director

ALLEGANY SCHOOL OF NATURAL HISTORY

REPORTS

THE WILLIAM JOHN GIES AWARD, RESEARCH FELLOWSHIPS AND GRANTS-IN-AID OF THE AMERICAN COLLEGE OF DENTISTS

THE Committee on Dental Research take pleasure in reporting that the accomplishment of two primary objectives, the initial bestowal of the William John Gies Award and the assignment of the first research fellowships and grants-in-aid, has coincided appropriately with the centennial of organized dentistry.

In undertaking the necessary survey of the need and opportunity for promoting dental research, our greatest encouragement and reassurance lay in the fact that

we could look to the International Association for Dental Research for guidance and support, relying upon the valuable experience gained by them in their continuous efforts towards the scientific solution of dental problems and the standards of quality and intelligence which have been set by their distinguished *Journal of Dental Research*. The association listened cordially to a preliminary outline of our plans and projects and lent to our deliberations the services of a cooperative committee, whose information, advice and support have been available at all points, and, needless to say, of inestimable service in the attainment of our objectives. We are indeed most grateful to

these gentlemen. The value and significance of being in touch with minds striving toward the upbuilding of dental science, and the intrinsic worth of their assistance in setting up definite standards and regulations will be an enduring influence, we hope, in making the administration of our research funds an increasingly effective stimulus to professional and scientific growth.

In accordance with the policy of the college to give public recognition to one who in any field of science has made an outstanding contribution to the progress of dentistry, the Centennial Celebration in Baltimore was selected as a most fitting occasion for the initial William John Gies Award of the college. It was therefore bestowed, on March 17, 1940, upon Peter John Brekhus, of Minneapolis, for distinguished services in the cause of dental education and research in this country. The award, in the form of a suitably engrossed citation, was presented not only to glorify the recipient in the eyes of his fellow-workers, thus adding to the prestige of the quietly effective labors to which our research workers are faithfully devoting themselves, but also to acknowledge, as openly and strikingly as possible, the debt of all members of our profession to those who fulfil in highest measure the avowed function of us all—to enlarge the scope of dental science so far as experience, ability and opportunity will permit. It is the earnest hope of our committee that the simple ceremony at Baltimore may have impressed upon the public at large the fact that we—the whole body of our profession—are engaged upon an endless quest, to seek out the ultimate laws of health and discover more and more surely the principles which govern their application to human welfare.

Our research fellowships and grants-in-aid are intended as a practical expression of this same fundamental need in our professional life—a need not only of the results which research may produce, but also of the pervading influence of the spirit of research. We must live not only in the present, with its task and its reward; but with the zest of fresh discoveries and new insights which may lie just ahead—with the constant

expectation that old difficulties will vanish as the forces of nature are better understood. Little by little we can gain upon the vast areas of the unknown; and to promote this conquest the research funds have been awarded, with our best wisdom and discrimination, after due study of the credentials and projects of the applicants by a subcommittee which had previously set up the necessary mechanism of appropriation, application, supervision and publication of results. The names of the successful applicants, with the sums awarded, the inquiries and where they are to be pursued are as follows:

Dr. Harrison R. Hunt and Dr. Carl A. Hoppert, \$100.00, "Inheritance factor in resistance and susceptibility to dental caries in rats," Michigan State College.

Dr. Albert H. Kniesner, \$500.00, "The factors in saliva which influence the growth of *L. acidophilus* and are indicative of the presence or absence of dental caries," School of Dentistry, Western Reserve University.

Dr. Sidney B. Finn, \$1,200.00, "The effect of applications of sodium fluoride in preventing and controlling dental caries in children," School of Dentistry, University of Rochester.

Dr. Samuel Seltzer, \$500.00, "The anti-bacterial action of drugs which have been recommended for cavity sterilization," Dental School, University of Pennsylvania.

Dr. M. L. Tainter, \$400.00, "The general problems involved in the evaluation of the abrasiveness of dentifrices and their individual constituents," College of Physicians and Surgeons, San Francisco, Calif.

Dr. James Nuckolls, \$500.00, "The primary centers of lobular development, growth and calcification in the tooth," Dental College, University of California.

Dr. B. Orban, \$500.00, "Wound healing after different methods of gingivectomy and post-operative treatment," Dental School, Northwestern University.

William J. Furuta, \$1,000.00, "Histologic study of the effect of various mineral deficiencies in dental and oral structures in animals," College of Dentistry, University of California.

A. L. MIDGLEY,
Chairman

COMMITTEE ON DENTAL RESEARCH OF
THE AMERICAN COLLEGE OF DENTISTS

SPECIAL ARTICLES

THE VOLTAMMETRIC DETERMINATION OF OXYGEN

By the term "voltammetry" we mean the determination and interpretation of current-voltage curves obtained in electrolysis experiments using a suitable microelectrode as an indicator electrode. By indicator electrode we mean that the current is determined entirely by the phenomena occurring at that particular electrode, the potential of which may be varied by varying the e.m.f. applied across the electrolysis cell

consisting of the indicator electrode and a depolarized reference electrode of practically constant potential. When using the dropping mercury electrode the terms "polarography" (self-registering apparatus) and "polarometry" (manual apparatus), introduced by Professor J. Heyrovsky in Prague, are synonymous with voltammetry.

Oxygen can be determined in a simple way with the dropping mercury electrode.^{1,2,3} Our studies have

¹ V. Vitek, *Coll. Czech. Chem. Comm.*, 7: 537, 1935.

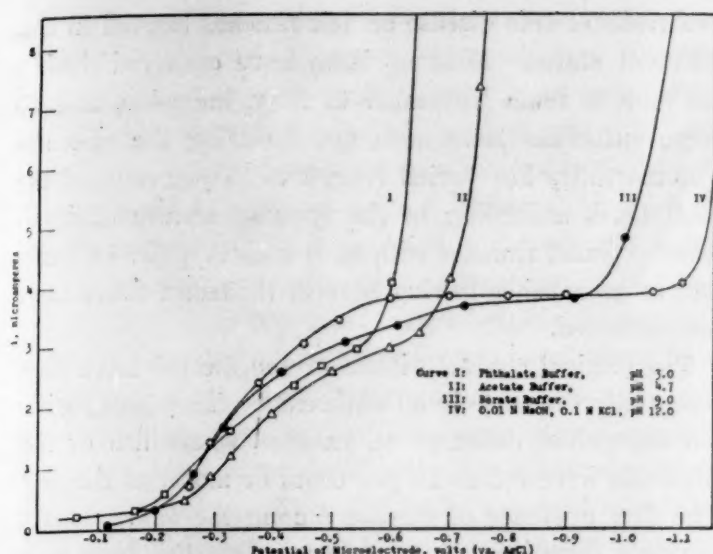


FIG. 1. Reduction of oxygen in various air-saturated solutions.

shown that oxygen can also be determined voltammetrically by using a platinum wire microelectrode. The electrode consisted of a platinum wire 4 mm long and 0.5 mm in diameter sealed on the end of a glass tube and suspended in the solution. A 0.1 N silver-silver chloride electrode was used as a reference electrode. Fig. 1 shows some current-voltage curves obtained at 25.00° C. in various air-saturated buffer solutions with pH values between 3 and 12. The diffusion current was found to be proportional to the oxygen concentration, but it changed markedly (about 4 per cent. per degree) with the temperature. From our results we calculated that the diffusion coefficient of oxygen is $2.38 \times 10^{-5} \text{ cm}^2 \text{ sec}^{-1}$ at 25° C.

A disadvantage of the wire electrode is that at each value of the applied e.m.f. it is necessary to wait about two minutes until a steady state has been reached. From then on the current remains constant for relatively long periods of time. This constancy of the current is an advantage over the dropping mercury electrode, with which a fluctuating current is obtained. A disadvantage is that the hydrogen overvoltage on platinum is very small, so that in relatively weakly acid medium (pH less than 6) the discharge of hydrogen interferes with the determination of the diffusion current of oxygen.

The disadvantage of waiting for a steady current state can be eliminated by working with a rotating

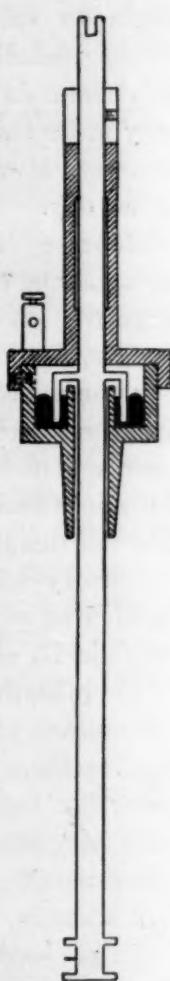


FIG. 2.

electrode. The speed of rotation must be kept constant in order to get reproducible results. Fig. 2 shows a mercury-sealed electrode which was rotated at 600 R.P.M. by means of a synchronous motor. From a practical viewpoint the rotating electrode has the following advantages: (1) the current is immediately constant and (2) the measured currents are much larger than with the stationary electrode. For example, the diffusion current of oxygen in an air-saturated solution was 3.5 microamperes with the stationary electrode and about 60 microamperes with an electrode of the same size rotating at 600 R.P.M. Thus, the rotating electrode can be used for the determination of traces of oxygen.

Fig. 3 shows some current-voltage curves obtained with an air-saturated solution of 0.1 N potassium chloride, and the same solution after bubbling tank nitrogen through the solution for 10 minutes.

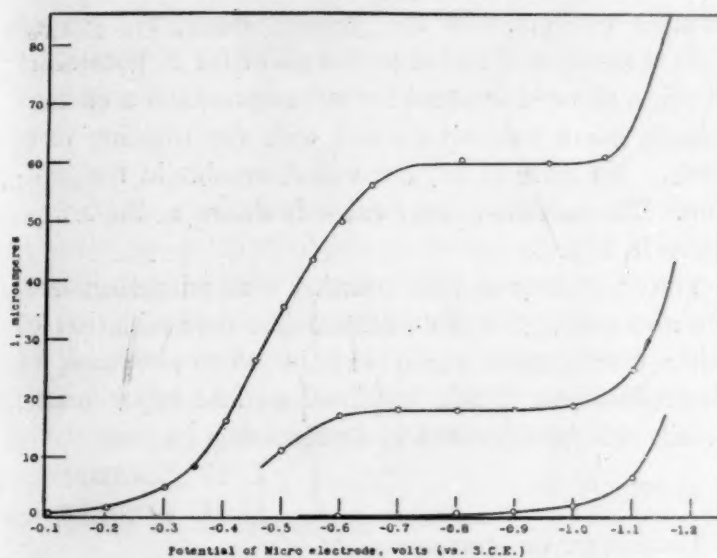


FIG. 3.

The rate of removal of dissolved oxygen by bubbling unpurified tank nitrogen through the solution at a rate of about 4 bubbles per second is shown by the data given in Table 1, which shows the diffusion current as a function of the time of bubbling nitrogen through the solution.

TABLE 1

Time of bubbling N ₂ , min.	0	5	10	15	20	30	40	60
i _a , microamperes ...	61.0	31.7	18.0	8.87	3.55	1.40	0.94	0.79

A longer time of bubbling did not appreciably lower the diffusion current. Tank nitrogen from which oxygen was removed by passage through an electric heating tube containing copper turnings at a temperature of about 500° did not give an appreciably lower diffusion current, even after prolonged bubbling. It was shown that the trace of oxygen remaining in the solution diffused through the agar plug and sintered glass plate

² H. G. Petering and F. Daniels, *Jour. Am. Chem. Soc.*, 60: 2796, 1938.

³ C. S. Miller, Ph.D. Thesis, University of Minnesota, 1940.

separating the two halves of the electrolysis cell,⁴ since the diffusion current of oxygen increased from 0.79 microampere to 1.10 microamperes when the solution was allowed to stand for 10 minutes with no nitrogen bubbling, but the electrode rotating. By using a large silver anode in a simple cylindrical electrolysis cell, it was possible to reduce the diffusion current of oxygen to 0.60 microampere using unpurified tank nitrogen and to 0.20 microampere using the purified nitrogen.

Assuming that the residual current in an entirely air-free solution was given by the current obtained in the sulfite experiment described below (0.15 microampere at 0.8 V vs. S.C.E.), the oxygen content of the unpurified tank nitrogen is calculated to be 0.15 per cent., and that of the purified nitrogen 0.02 per cent.

Heyrovsky⁵ and Hohn⁶ describe the use of sodium sulfite to remove dissolved oxygen, but give no quantitative data regarding its efficiency, or the rate of the reaction between oxygen and sulfite in neutral or alkaline medium. In the present study, 0.1 gm of sodium sulfite was added to 100 ml of 0.1 N potassium chloride, allowed to stand for 10 minutes, and a current voltage curve was determined with the rotating electrode. No trace of oxygen was detectable in the solution. The current-voltage curve is shown as the lowest curve in Fig. 3.

The stationary and the rotating wire microelectrodes are also useful for the voltammetric determination of other constituents which can be electro-reduced or electrooxidized. These applications and experimental details will be discussed in forthcoming papers.

I. M. KOLTHOFF

H. A. LAITINEN

UNIVERSITY OF MINNESOTA

A DEFICIENCY DISEASE OF FOXES

A DIETARY disease that occurs in animal populations and is associated with the feeding of fish has been found in our investigations to be a vitamin deficiency and to be the counterpart of the alcoholic polioencephalitis of man described as Wernicke's disease. This condition, which we have for years termed "Chastek paralysis," is of considerable economic importance in the fox-raising industry. Clinically, it presents a well-defined syndrome characterized by a preliminary period of anorexia lasting a week or ten days, followed by a rapid development of weakness, ataxia and spastic paralysis. Death usually occurs within 48 to 72 hours after the onset of neurologic disturbances. Up to the present time we have observed

⁴ J. J. Lingane and H. A. Laitinen, *Ind. Eng. Chem., Anal. Ed.*, 11: 504, 1939.

⁵ J. Heyrovsky, "Polarographie," in W. Böttger, "Physikalische Methoden der Analytischen Chemie," Bd. 2, Akad. Verlagsgesellschaft, Leipzig, 1936.

⁶ H. Hohn, "Chemische Analysen mit dem Polarographen," Verlag von Julius Springer, Berlin, 1937.

outbreaks of this disease on fox ranches located in five different states. Most of them have occurred during the months from November to May, inclusive, and no large outbreaks have been noted during the summer. The mortality has varied from 1 to 37 per cent. of the total herd, according to the type of treatment instituted. Small ranches with as few as 17 pairs of foxes and large ranches having several thousand foxes have been affected.

The clinical characteristics of the disease have been essentially the same in all outbreaks. They have, without exception, occurred on ranches where fish or fish products were fed as 10 per cent., or more, of the diet. The first evidence of disease among the foxes usually appears from three to six weeks after fish have been added to the diet. The foxes show only anorexia for a week or 10 days and then a few animals at a time begin to exhibit signs of neurologic disturbances. These include weakness and unsteady gait, ataxia, hyperesthesia and spastic quadriplegia. Convulsions may occur shortly before the animal dies. The symptoms are always progressive and lead to death within a few days.

Repeated attempts to demonstrate an infectious agent as the cause of the disease have been consistently negative. A total of about 190 red foxes, 20 dogs, 7 ferrets, 6 mice, 6 squirrels and 12 rabbits and guinea pigs have been inoculated with suspected material by intraperitoneal, subcutaneous, intramuscular or intracranial routes or have been fed the material by stomach tube in attempts to transmit the disease. In no case has the disease been successfully transmitted.

Dietary experiments show that this disease can readily be produced by feeding foxes a ration poor in vitamin B₁ and containing fresh fish.

Carp has been the most common species of fish used on ranches where this disease has appeared. However, quillbacks, mullets and suckers, and Atlantic whiting have also been incriminated. The fish causing this disease have come from a variety of sources, including the Atlantic Ocean, fresh-water lakes in Utah, Minnesota and Canada, and the Cedar River in Iowa.

It is clear that the course of all the outbreaks has been determined by the dietary management on the ranch. In all cases the disease has been progressive, involving an increasing number of foxes as long as fish remained in the diet. In most instances the owner of the fox farm has suspected fish to be a cause of the disease and has eliminated it from the diet within a short time after the first death occurred. On one ranch, however, the feeding of fish was not discontinued until three weeks after the first death, and the result was a mortality of 34 per cent. in a herd of over 200 foxes.

After fish has been eliminated from the fox ration,

the outbreaks have subsided either rapidly or very gradually, depending upon other dietary factors. Force-feeding diluted milk, liver juice and small amounts of yeast has brought about recovery of animals in which the disease has progressed to the ataxic or even to the paralytic stage. Recent field trials of synthetic vitamin B₁ as a specific therapeutic agent have produced very favorable results.

Pathologically, the most characteristic lesions are found in the central nervous system, and these have been used as a basis for routine diagnosis in our laboratories during the past five years. The diagnostic lesions occur almost invariably in bilaterally symmetrical locations. They are found ventral to the floor of the fourth ventricle, in the quadrigeminal plate, in certain nuclei just ventral and lateral to the aqueduct of Sylvius, in the thalamus and in certain locations in the cerebral cortex. Histologically, they are characterized by striking vascular changes which affect the smaller vessels. Irregular dilatation or varicose deformity occurs, together with a very marked proliferative reaction involving particularly the endothelial cells, but also, to some extent, the adventitia. These vascular changes result in small, diffuse hemorrhages. A degeneration of nerve cells, with a variable degree of neuroglial reaction, accompanies the vascular changes. The lesions are definitely focal and occur only in certain nerve centers. In their distribution and histologic appearances they are the counterpart of the lesions of Wernicke's polioencephalitis of man.

Alexander¹ has presented convincing evidence, based on animal experimentation, that Wernicke's disease in man is due to a deficiency of vitamin B₁ in the presence of an adequate supply of other vitamins. A study of those diets that bring about a rapid termination of outbreaks of the dietary disease in foxes, as well as

therapeutic trials with synthetic vitamin B₁, led us to conclude, independent of Alexander's investigations, that the dietary disease of foxes with which we were dealing with essentially a B₁ avitaminosis. The similarity of the pathologic changes in the brains of foxes with this disease and those in the brains of other animals with a vitamin-B₁ deficiency, as described by Alexander, lends further support to the view that a deficiency of vitamin B₁ is the cause of the disease in foxes. Since it is clear that the disease in foxes is brought about by their eating fish, we are led to the conclusion that the consuming of fish somehow produces a B₁ avitaminosis in foxes. The method by which it is brought about is not known, but that a deficiency does occur seems not unreasonable in the light of experimental and clinical data regarding B₁ avitaminoses in man and lower animals and in view of the chemical instability of thiamin. It seems a definite possibility that some substances in whole fresh fish and in alcoholic liquors are specifically destructive to vitamin B₁. A detailed consideration of facts relative to this point will be presented elsewhere.

SUMMARY

A common and highly destructive dietary disease of silver foxes in captivity is pathologically the counterpart of Wernicke's hemorrhagic polioencephalitis of man. The disease in foxes is caused by feeding fish as 10 per cent., or more, of the diet. It is probable that the fish induce a B₁ avitaminosis which causes the characteristic pathology and the resultant symptoms.

R. G. GREEN

UNIVERSITY OF MINNESOTA

C. A. EVANS

BUREAU OF BIOLOGICAL SURVEY,

U. S. DEPARTMENT OF THE INTERIOR

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE METHOD FOR PREPARING ANTIGENIC SUBSTANCES FROM THE TYPHOID BACILLUS

In several laboratories material has been isolated from the typhoid bacillus, *Eberthella typhosa*, which has proved antigenic when injected into small animals and, in some cases, in man. In general, the methods used may be divided into three groups: (1) fractionation of a tryptic digest of the organisms (Douglas and Fleming,¹ Raistrick and Topley,² Wakeman³), (2) fractionation of a trichloroacetic acid extract of the

bacilli (Boivin and coworkers⁴), and (3) dissociation and extraction of the active material by organic solvents such as diethylene glycol (Morgan⁵)⁶. An examination of the methods used and the products obtained indicates that the chief problem is the removal of protein from an antigenic complex largely carbohydrate in nature.

We describe here a different procedure, simple and rapid, which has proved useful for the examination of the antigenic constituents of several microorganisms and should be generally applicable to many others.

¹ Leo Alexander, *Am. Jour. Path.*, 16(1): 61-69, January, 1940.

² S. R. Douglas and A. Fleming, *Brit. Jour. Exp. Path.*, 2: 131, 1921.

³ H. Raistrick and W. W. C. Topley, *Brit. Jour. Exp. Path.*, 15: 113, 1934.

⁴ F. B. Wakeman, *Military Surgeon*, 84: 318, 452, 1939.

⁵ A. Boivin and L. Mesrobian, *Rev. d'Immunol.*, 1: 553, 1935.

⁶ W. T. J. Morgan, *Biochem. Jour.*, 31: 2003, 1937.

⁷ The use of concentrated urea solutions to dissociate and extract the antigen has been described recently by J. Walker (*Biochem. Jour.*, 34: 325, 1940).

Concentrated phenols are known to be good solvents for most proteins. This fact, together with our observation that many complex polysaccharides, such as gum acacia, pectic acid, gum karaya, chondroitin-sulfuric acid, etc., are insoluble in strong phenol solutions, suggested the possibility of the use of phenol in the purification of carbohydrates of bacterial origin. We found that the capsular polysaccharides of most of the types of pneumococci are insoluble in concentrated phenol and may easily be separated from associated proteins by extraction of the latter in phenol; the polysaccharides which are soluble in phenol have been similarly purified by fractional precipitation from phenol solutions by alcohol or glacial acetic acid. (The use of this method in the preparation of the type-specific polysaccharides of pneumococci will be the subject of a separate communication elsewhere.) Applying this method to dried typhoid bacilli, we have obtained a substance, probably still crude in nature, which is highly antigenic in mice.

Acetone-dried organisms of the U. S. Army Medical School strain 58 (Panama carrier strain) were repeatedly extracted with U. S. P. liquified phenol (88 per cent.), or better still, with 95 per cent. phenol, then with alcohol to remove phenol. The phenol-insoluble residue was dried with acetone, then extracted with neutral physiological saline (0.9 per cent. NaCl) or with water; the extract was clarified and precipitated with alcohol or alcohol-ether in the presence of sodium acetate. The precipitate was then subjected to a second phenol extraction, and the alcohol-washing, water extraction, clarification and precipitation were repeated. The final product (substance A) after drying with acetone is a fluffy white powder, which readily forms a viscous, faintly opalescent 1 per cent. solution in water or physiological saline.

Phenol extraction may likewise be used on the product obtained by the tryptic digestion procedure. A tryptic digest preparation, made according to Wakeman,³ gave a weak biuret reaction; one treatment with phenol removed the small amount of material responsible for this reaction. After clarification of the water extract of the phenol-insoluble residue, precipitation and drying, a product (substance B) was obtained which closely resembled substance A in appearance and properties.

Both substances, obtained in yields of 10 to 15 per cent. of the weight of the organisms, give negative or very faint biuret reactions and very strong Molisch reactions. Their nitrogen contents, corrected for ash and moisture, are 3.4 to 3.6 per cent. Hexosamine, if present at all, accounts for less than 10 per cent. of the total nitrogen. Both substances give strong precipitin reactions with antityphoid rabbit serum.

At least 50 per cent. of 88 white mice injected with

two doses of 4×10^{-7} mg of either substance A or B were protected from an infective dose of 5×10^4 live organisms of strain 58 suspended in mucin. At least half a control group of 40 mice were killed by 10 to 100 organisms similarly suspended. The immunizing doses were given one week apart and the infective dose one week after the second immunizing dose; the animals were then observed one week further. All injections were made intraperitoneally. The phenol-soluble material gave equal protection only in doses 10 to 1,000 times greater.

The antigenic power of substance A at least equals that of material we have prepared by Wakeman's method. Solutions containing 1 mg of active material per ml of physiological saline retain their antigenicity upon passing through a Berkefeld N filter.

Like the products described by others, our antigens were found to be toxic. In preliminary determinations of acute toxicity, a single intraperitoneal dose of 0.4 mg of substance A or B killed about 50 per cent. of 40 white mice within 24 hours. The injection of 0.1 mg under the skin of the abdomen of each of 10 guinea pigs caused a slight reddening and induration over the site of injection lasting one day in one animal and two days in another; the other animals showed no reactions. Intravenous doses of 0.1 mg in rabbits caused the death of two of ten rabbits within two hours and an average maximal elevation of temperature in the others of 2.2° F.

Further reports on the chemical, immunological and toxic properties of these substances will appear later.

JOHN W. PALMER

TILLMAN D. GERLOUGH

BIOLOGICAL LABORATORIES,
E. R. SQUIBB AND SONS,
NEW BRUNSWICK, N. J.

BOOKS RECEIVED

- BELGODERE, FRANCISCO JAVIER A. *La Verdad, la Ciencia y la Filosofía*. (Tratado de Eurística Razonada.) Pp. 256. S. Turanzas del Valle, Mesones 97, Mexico.
- BENT, ARTHUR C. *Orders Psittaciformes, Cuculiformes, Trogoniformes, Coraciiformes, Caprimulgiformes and Micropodiiformes*. Pp. viii+506. 73 plates. Smithsonian Institution. Superintendent of Documents, Washington, D. C. \$0.75.
- HERMS, WILLIAM B. and HAROLD F. GRAY. *Mosquito Control*. Pp. xii+317. 60 figures. Commonwealth Fund, New York. \$3.50.
- HUME, EDGAR E. *Medical Work of the Knights Hospitallers of Saint John of Jerusalem*. Pp. xxii+371. 130 figures. Johns Hopkins Press. \$3.00.
- LOHR, LENOX R. *Television Broadcasting: Production, Economics, Technique*. Pp. xiv+274. 88 figures. McGraw-Hill. \$3.00.
- MCCREERY, JAMES L. *Exploring the Earth and Its Life in a Natural History Museum*. Revised edition. Pp. vii+312. Illustrated. Stokes. \$2.50.
- University of Missouri Studies: April, 1940; Lewis and Clark, Linguistic Pioneers*. ELIJAH H. CRISWELL. The University, Columbia. \$1.25.